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THE YELLOW-RED VIROSIS OF PEACH: ITS IDENTIFICATION AND CONTROL

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ABSTRACT

YELLOW-RED virosis or "X" disease of peach has been causing serious damage to peach orchards in New York State since 1938. This disease is becoming widespread thruout the northeastern and northcentral states on both the peach and the common wild host, the chokecherry.

This disease may be recognized on the peach by the striking contrast between the diseased and healthy branches on trees during midsummer when the leaves on the diseased parts are shed after turning yellow and displaying purplish-red areas which become brittle and fall out leaving irregular holes. Infected branches bear no good fruit, but some of the small fruits turn to mummies and remain attached to the tree thruout the season.

The most striking symptom of the disease on the chokecherry is the bright yellow to red coloring of the foliage from mid-June till frost. Infected plants become progressively weaker, showing a tendency to form rosettes on the terminal growth and then die.

The yellow-red virosis is similar to other virus diseases of stone fruits in that it can be transmitted from one plant to another by means of buds or grafts. The natural means of transmission is still unknown tho field evidence indicates that it is probably spread by some insect.

The spread of the disease thru a peach orchard may be very rapid if diseased chokecherries are allowed to remain near the planting. Many orchards have been ruined in three or four years. On the other hand, the disease is held well in check by the removal of all chokecherries before the disease appears. Where the chokecherries cannot be controlled by cultivation they may be destroyed by spraying their foliage in midsummer with sodium chlorate or ammonium sulfamate at the rate of ¾ pound per gallon of water.

No peach varieties have been found to be resistant to this disease when inoculated with diseased buds. Some of the other stone fruits which have been artificially infected with the virus by means of diseased buds included nectarines, apricots, almonds, and some of the wild plums and cherries.

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INTRODUCTION

PEACH growing is of considerable importance in New York with an average annual production of 1,433,000 bushels between 1930 and 1939. Consequently, fruit growers are vitally interested in the "yellow-red virosis" or "X-disease" of peach. During the past five years it has already damaged many New York orchards and seems likely to do the same in many more unless the necessary precautions are taken to stop it. When a disease survey of the Hudson Valley revealed its presence in the State in 1938, a coordinated experimental investigation of this new malady was started by Cornell University and the State Agricultural Experiment Station to determine the cause, nature, and practical control methods.

The purpose of this bulletin is to present the necessary information to enable fruit growers to recognize the disease in their orchards and on the wild hosts, to understand the nature of the disease, to acquaint them with the serious damage that results when preventive measures are neglected, and to present information on control methods.

DISCOVERY AND KNOWN DISTRIBUTION

This relatively new disease first appeared in Connecticut where it was brought to the attention of the Connecticut Experiment Station in 1933, altho field evidence and growers' statements indicate that it was probably present in a few orchards several years earlier. How the disease became established in Connecticut is unknown.

In 1938 a preliminary survey in this State revealed its presence in Columbia, Dutchess, and Greene counties where it was already causing considerable damage in a few peach orchards which had been recently infected. The presence of the disease in wild chokecherries, *Prunus virginiana*, was evident over a much wider range.

In the nine years since its discovery this disease has spread thruout the northeastern and northcentral states on the chokecherry, which

is a common wild host in this area. It was reported on this host from as far west as Illinois and Wisconsin by 1939.

According to Stoddard[1], as recently as 1937 infected peach trees were confined chiefly to Connecticut. Newly infected peach orchards were reported from eastern New York in 1938, and the following year Boyd[2] reported that this disease was already causing more damage to peaches in Massachusetts than any other two diseases, even tho it had not yet spread to all peach sections.

By 1940 it had spread south in the Hudson Valley into Ulster and Putnam counties and into Niagara, Orleans, and Wayne counties in western New York. In 1941 it was reported on peaches in Michigan and in Ontario, Canada. A similar disease has been reported from several western states, but this trouble, while similar in symptoms, may be caused by a different virus or a different strain of the same virus.

IDENTIFICATION

Since both the chokecherry and the peach are infected by the yellow-red virus, it seems essential that peach growers be able to recognize the disease on both plants. Some of the symptom expressions of this disease are so distinct from other common ailments that with a little study of the following descriptions and the color reproductions (Plate I), the presence of the virus in or near the orchard should be easily detected during July and August when the contrast with the normal trees is the greatest.

The first name applied to this disease was X-disease as the cause was then unknown. The present name of "yellow-red virosis" was suggested because yellow is the predominant color of the diseased peach trees, red is the common color of the diseased chokecherries, and virosis places it in the virus group. The scientific name applied to the disease virus by Holmes is *Marmor lacerans* H.

SYMPTOMS ON PEACH

Peach trees infected with the yellow-red virosis look normal in the spring, except in advanced stages of the disease in which case the leaf and shoot growth may be stunted. One of the earliest symptoms is a rolling and yellowing of the leaves on infected branches or twigs about

[1]Stoddard, E. M. The "X disease" of peach. *Connecticut Agr. Exp. Sta. Circ. No. 122. 1938.*

[2]Boyd, O. C. Distribution of X-disease of peaches in Massachusetts. *Plant Dis. Reporter*, 23: *341–342. 1939.*

the middle of June, which makes a striking contrast with the uninfected parts of the tree. Yellowish to red or purple areas of various shapes and sizes appear on the leaves and soon become brittle and crack out, leaving irregular holes which give the leaves a very tattered appearance. Some of the leaves start to fall as soon as the symptoms appear; in fact, some may drop before spotting occurs on them. The basal leaves drop first and defoliation progresses up the terminal until only two or three small spotted leaves remain at the tip. These tip leaves remain long after the others have fallen, usually into September, and serve as a good diagnostic characteristic.

Infected branches are weakened and may die back during the winter. Trees which have been infected more than one year usually show some dead wood. Diseased trees may remain alive for several years but produce no good fruit on the affected branches. Infected parts may blossom, but they either fail to set or the small fruits mummify about the time leaf symptoms appear. These mummies often remain on the trees all season. Branches which show symptoms after the fruit has set may have enough vigor to mature it, but the fruit is usually soft and of poor quality.

SYMPTOMS ON CHOKECHERRY

Symptoms of the yellow-red virosis on chokecherry begin to appear about the middle of June, as with the peach. Early symptoms on the chokecherry are often a slight rolling of the leaves which exposes the under surface, giving the plants a silvery cast. In other cases or following this early symptom a gradual change from green to yellow or red may progress from the margins and tips towards the midrib and base until by late August most of the upper leaf area has lost its green color. Infected plants make a striking contrast to the healthy plants which remain dark green thruout the season. The color seems to vary with the individual plant since yellow, red, and intermediate shades of bronze-colored foliage may be found on plants growing side by side.

In contrast to the spotted and tattered peach foliage, the chokecherry leaves show no definite spotting and no shot-holing, altho the leaves are often full of small holes due to other causes. Neither do the colored leaves fall as they do on the peach, but remain as long as leaves on the healthy plants. After the first year some of the plants show a tendency to form rosettes at the ends of the terminals. Plants infected for several years are usually not as highly colored as those

more recently infected. Infected plants produce very few fruits. The plants may bloom, but most of the cherries fail to set. The disease soon weakens the plants so much that many are dead after four years.

OTHER PEACH INJURIES WHICH MAY COMPLICATE IDENTIFICATION

It is well known that peach foliage is subject to many injuries which cause red or necrotic spots, general yellowing, and dropping of leaves. Perhaps the most common is arsenical injury which is usually marginal. Sometimes even the small amount of arsenate of lead which drifts when spraying interplanted apples is sufficient to cause spotting and dropping of leaves. Copper sprays will also cause leaf injury. Peach trees weakened by borers, by winter cold or drought, or by lack of sufficient nitrogen often have yellowish leaves with or without red spots. In such cases the spots are usually quite small and do not drop out. In all the above cases the whole tree is usually affected which is in contrast with the partial infection that characterizes early infections of yellow-red virosis, especially in the orchard. In general, on vigorous trees, the positive identification of this disease is easy, but on weak trees the symptoms are not as pronounced and there is more danger of confusion.

In 1940 brown rot caused considerable blossom blight on peaches in New York State and many cankers formed at the base of the infected flowers. During the summer these cankers girdled the terminal growth which caused the leaves to turn yellow and wilt. Viewed from a distance these trees appeared to be infected on several terminals with the yellow-red virus, but a closer examination revealed no spotting of the leaves and no defoliation of the fresh leaves, but instead the girdling canker of the brown rot fungus and the wilted terminal leaves.

INFECTIVE NATURE

Buds from diseased peach trees placed on healthy plants serve to infect the new host if union of the tissues is formed. Hildebrand[3] has shown that if such inoculated plants are forced into new growth after union is established, symptoms of the disease may become evident within a few weeks on the new leaves formed either above or below

[3]Hildebrand, E. M. Rapid transmission of yellow-red virosis in peach. *Contr. Boyce Thompson Inst.*, 11: *485–496. 1941.*

the inserted bud. Inoculated plants which are not stimulated into new growth show no symptoms until the following year.

No organism visible under the ordinary microscope has been found associated with this disease, yet the fact that it can be readily transmitted from one plant to another by means of buds or other grafts indicates that some causal agent is being transferred with the host tissue which places this malady in that group known as virus diseases. A virus has been described as, "An exceedingly minute infective principle, smaller than bacteria, and not visible under the highest magnification of the microscope". Some of the more familiar plant virus diseases are raspberry mosaic, potato mosaic, peach yellows, and little peach.

Once this virus becomes established in a plant it spreads to all parts which may require four or five years in the case of old trees or may take place in one year where young vigorous trees are concerned. That the virus spreads thru the tree in advance of any visible symptoms is proved by the fact that the removal of all branches showing symptoms has not been successful in checking its advance even when the cuts are made at considerable distances beyond any visible symptoms.

DISSEMINATION

The natural means of dissemination of the yellow-red disease is still unknown. Field evidence indicates that it is probably spread by some insect carrier. Most other plant viruses are carried from plant to plant by the feeding of specific insects which suck the virus-infected juice from a diseased plant and inject small amounts into the new host with each feeding. Many insects have been tested as carriers of this disease by various workers but to date none has been found to transmit the disease.

Under natural conditions this disease seems to spread more rapidly on the chokecherry than on the peach and spreads from chokecherry to peach rather than from peach to peach or peach to chokecherry. Diseased peach trees are always accompanied by diseased chokecherries, whereas diseased chokecherries may be found miles from any peach trees. Where both hosts are growing side by side, the peach trees do not show symptoms until a year after the chokecherries have shown symptoms. Peach orchards isolated from all chokecherries have remained free from the disease.

Budding experiments have demonstrated that the virus can pass

from chokecherry to peach, from chokecherry to chokecherry, from peach to chokecherry, and from peach to peach. It would seem, therefore, that any lack of spread from peach to peach in the orchard must be due to the feeding habits of an insect carrier.

RATE OF SPREAD IN PEACH ORCHARDS AND ATTENDING DAMAGE

The rate at which this disease has spread westward over the northeastern and northcentral states during the past nine years has already been pointed out. It remains to be shown how it spreads in individual orchards and how this spread is correlated with the presence of diseased chokecherries. Several orchards have been carefully mapped and records kept of new infections beginning before or at the time the first diseased trees became evident. The data accumulated from orchards where the chokecherries were not removed indicate a very rapid spread of the disease thruout the orchard with from 10 to 30 per cent of the trees showing infection with each succeeding year until by the fourth year the orchards are usually in such bad shape that they are given up. While infected trees are not always killed outright the infected parts bear no good fruit and in three or four years the entire tree is unfruitful.

Three peach orchards in Dutchess County, designated as A, B, and C in Fig. 1, have been under observation since 1938 to determine the value of removing the diseased chokecherries from the vicinity of the orchard. In each case some of the chokecherries were diseased in 1938 and most of them were infected the following year when the orchards were mapped.

Orchard A had 2 per cent of the peach trees showing symptoms of yellow-red virosis in 1939. In September of that year all chokecherries within 100 feet of the orchard were sprayed with Atlacide, a sodium chlorate herbicide, used at the rate of ¾ pound to each gallon of water. A very high percentage of the plants sprayed were killed. In 1940 another 17 per cent of the trees in this orchard showed the disease as they had been infected prior to the destruction of the chokecherries. In 1940 the chokecherries were removed from an area within 200 feet of the peach trees and all new shoots from those treated the year before were sprayed again. In 1941 no new cases of infected peach trees were evident, but all the previously infected trees were removed. No new cases of the disease were found in 1942.

Nine per cent of the peach trees in orchard B were infected in 1939 and an additional 11 per cent showed typical symptoms in 1940. No

steps were taken to destroy the chokecherries growing along one side of the orchard in 1939, but in 1940 they were sprayed with Atlacide. Some of the plants, however, were missed or not thoroly sprayed. By 1941 another 9 per cent of the peach trees were infected. That season all the diseased peach trees (29 per cent) were removed and the fence row was given a thoro herbicide spray treatment which killed all the chokecherries. As a result of this cleanup program only one diseased tree was found in 1942 and this one had probably been overlooked the previous year.

Orchard C showed no diseased peach trees in 1938, but a few of the chokecherries growing along two sides of the orchard were showing symptoms of the yellow-red disease. The owner was not interested in removing the chokecherries from the edge of this planting so it was used as an untreated check for orchards A and B. In 1939, 22 per cent of the peach trees in this orchard were diseased. An additional 17 and 22 per cent became diseased in 1940 and 1941, respectively. This orchard was abandoned in 1941 with a total of 61 per cent of the trees infected.

It should be noted that in orchards A and B there was a lag of one year between the time the chokecherries were destroyed and the stoppage of new infections in the peach trees. This is due to the fact that under field conditions trees inoculated one year do not show symptoms until the following season. The trees showing the disease following the removal of the chokecherries were really already infected as the result of inoculations the previous year while the wild host was still present. This explains the advantage of destroying the chokecherries before they or the peach trees show symptoms.

In each of the above orchards, and in most others under observation, the first trees to show the disease are those nearest to the diseased chokecherries. These trees also show the highest percentage of branches infected, while those a few hundred feet away may show no disease at all. Many growers in the State had removed the chokecherries near their peach plantings before the disease reached them and in none of these orchards has the disease appeared on the peach trees. Some growers who thought they had removed all chokecherries were surprised to find an occasional peach tree infected, but in such cases a search revealed the presence of a small diseased chokecherry plant perhaps under a peach tree or hidden by other plants in the fence row.

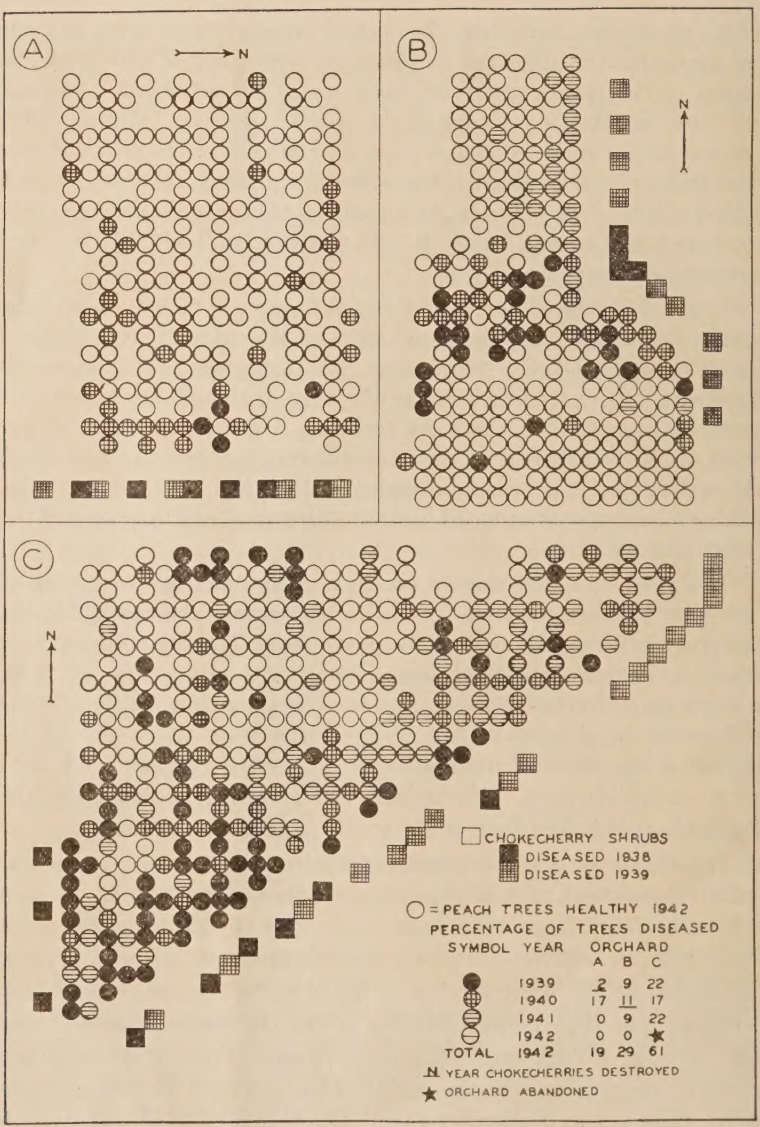

FIG. 1.—CHOKECHERRY REMOVAL IN RELATION TO THE INCIDENCE OF YELLOW-RED DISEASE IN PEACH ORCHARDS.

Three Dutchess County orchards showing the disease for the first time in 1939 received the following treatment: chokecherries destroyed in A, 1939; B, 1940–41; C, not destroyed. The destruction of peach trees in these orchards by 1942 totaled 19, 29, and 61 per cent, respectively.

PLATE I.—YELLOW-RED VIROSIS.

A, Severely diseased Elberta peach tree (August 1939) in its second season of infection, pruned heavily to eliminate branches either killed or injured because of the disease during the previous season. It shows typical chlorotic lacerated foliage and defoliation and is maturing fruits as is the custom only on the occasional healthy-appearing branches. B, Branch of an affected peach tree showing leaf symptoms before much defoliation had taken place. C, Chokecherry plant showing second-year symptoms in the field consisting of beautiful red foliage below and rosettes of dwarfed, greenish, rugose leaves at the terminals. D and E, Diseased chokecherry plants characterized by yellowish and red foliage.

CONTROL

Once the yellow-red virus enters an orchard plant it cannot be easily destroyed by any known practical means. As there is no known treatment which will prevent infection, the only control lies in the field of prevention by the eradication of all sources of infection or by the use of resistant varieties.

ERADICATION

Diseased peach trees bear little if any fruit after the first year of infection and may as well be removed at once. Experiments have shown that the removal of infected branches from peach trees will not save the tree because the virus is already present in tissues which do not show symptoms.

The best protection is obtained by the removal of all chokecherries within 500 feet of the orchard before the disease appears. The wild chokecherries act as a bridge over which the virus spreads from one orchard to another. If this bridge is effectively broken before the disease appears, the orchard will have a good chance of escaping infection.

The methods used to destroy the wild host will depend on circumstances. Where the land is open and can be kept under cultivation, that alone will be sufficient to destroy the plant. However, the chokecherry is apt to be found mostly along fence rows, stone walls, and rocky places where thoro cultivation is impossible. Under these circumstances the first impulse is to cut or burn the plants. This is a poor thing to do for the chokecherry has a vigorous root system and such treatments, even tho repeated several times, have little effect on killing the plants but only make them harder to kill by chemical means because the tops have been removed.

The use of herbicide sprays appears to be the best way to destroy this host. One thoro application of an herbicide containing sodium chlorate or ammonium sulfamate at ¾ pound to each gallon of water will give an almost complete kill if applied to the foliage in midsummer to plants which have not been recently cut. Both materials have given a good kill of chokecherry, but the sulfamate seems to kill a wider range of plants, which is a point to keep in mind when all of the plants in the hedge row are to be destroyed (Tables 1 and 2).

The amount of spray required to cover 100 square feet will vary from 1 to 3 gallons, depending on the density and height of the plants

and the type of spray equipment used. Care should be taken to wet all the leaves from both the top and bottom sides.

TABLE 1.—ABILITY OF VARIOUS CHEMICALS TO KILL CHOKECHERRY PLANTS WHEN USED IN FOLIAGE SPRAYS APPLIED WITH POWER SPRAYER, RED HOOK, N. Y., 1939.

TREATMENT*		APPROXIMATE COST PER 100 GAL.	KILL OF CHOKECHERRIES
Applied in July†			
Atlacide (sodium chlorate powder)	75–100	$6.50	Good
Herbicide (arsenite-liquid)	5–100	5.00	Poor
Elgetol (regular-liquid)	2–100	4.00	Poor
D.N. (powder)	6–100	3.30	Poor
Copper sulfate (snow)	20–100	1.20	Poor
Applied in September‡			
Atlacide	75–100	6.50	Good
White arsenic 16 plus caustic soda	8–100	1.50	Poor
Elgetol 600	1–100	3.00	Poor
Sinox plus sodium bisulfide	1–2–100	2.20	Poor

*Concentrations are expressed as pounds or gallons per 100 gallons of spray mixture. The Elgetol regular, 600, and Sinox are sodium salts of dinitro-o-cresol and differ from each other in the kinds or amounts of penetrating agents contained in the mixture. The DN powder used was dinitro-ortho-cyclo-hexylphenol.

†Materials tested in July were applied at the rate of about 6 gallons per 100 square feet of hedge row. Most of the treatments burned the leaves but new growth soon appeared from the lower parts of the plants.

‡Materials applied at about 4 gallons per 100 square feet.

The leaves absorb the toxic salts which are then carried into the roots so the whole plant is slowly killed. The tops of the sprayed plants should not be cut until two or three weeks later to allow sufficient time for the translocation of the toxic salts thruout the plants above and below ground. Plants which have been cut within a year before the treatments are made will be harder to kill since the leaf surface is reduced in proportion to the roots. Under these conditions a second application may be required later in the same year or during the following season in order to kill any new shoots which may grow up from the roots. In any case it is well to make an inspection every year since seedlings may continue to come up for some time.

The arsenical types of herbicides have not proved satisfactory for spraying chokecherries (Tables 1 and 2). They kill the leaves so quickly that translocation is stopped before the roots are killed. Ground applications of arsenical materials have also been tried with poor results when concentrations comparable in cost with sodium chlorate were used.

Table 2. Ability of Various Chemicals to Kill Chokecherries When Used in Foliage Sprays Applied with Hand Sprayer, Poughkeepsie, N. Y.

Date applied	Treatment	Amount per gal., lbs.	Gallons per 100 sq. ft.	Results on chokecherries		Other plants not killed
				Aug. 1941	New growth, 1942	
July, 1940	Ammonium sulfamate	¾	2	Good	None	
	Sodium chlorate	¾	2	Good	None	Blackcherry
June 17, 1941	Ammonium sulfamate	½	1	Poor	Yes	Grape, ash
		¾	1	Fair	Little	
		1	1	Good	None	
		1	2	Good	None	
	Atlacide (sodium chlorate)	½	1	Fair	Yes	Poison ivy, sumac, grape
		¾	1	Good	Little	Poison ivy, sumac, grape
		1	1	Good	None	Poison ivy, sumac, grape
		1	2	Good	None	Poison ivy, sumac, grape
	Sodium meta arsenite	½	1	Poor	Yes	Poison ivy, dogwood
		¾	1	Fair	Yes	Poison ivy, dogwood
		1	1	Good	Yes	Poison ivy, dogwood
		1	2	Good	Yes	Poison ivy, dogwood
	Kerosene undiluted	—	1	Good	Yes	Poison ivy, dogwood
June 30, 1941	Ammonium sulfamate	½	1	Poor	Yes	Grape, dogwood
		¾	1	Fair	Little	Grape, dogwood
		1	1	Good	None	
		1	2	Good	None	
	Sodium meta chlorate	½	1	Good	Yes	Poison ivy, grape, dogwood
		¾	1	Good	None	Poison ivy, grape, dogwood
		1	1	Good	None	Poison ivy, grape, dogwood
		1	2	Good	None	Poison ivy, grape, dogwood
Aug. 29, 1941	Ammonium sulfamate	¾	2	Good	None	
	Altacide	¾	2	Good	None	Poison ivy

Sodium arsenite can be used successfully to kill large trees or scattered plants. The method consists of wounding the trunk near the ground by means of knife or axe cuts. The cuts should not be over 2 inches apart and should encircle the trunk. Two cuts on opposite sides are sufficient for plants less than 2 inches in diameter. A few drops of sodium arsenite solution are placed in these cuts by means of a long-nosed oil can or similar container. The toxic mixture consists of 2 pounds of sodium arsenite ($NaAsO_4$) in a gallon of water. This treatment should be made sometime between August and December when the flow of plant sap will carry the toxic material towards the roots.

Due precautions should be taken in using these chemical treatments. Sodium chlorate is somewhat injurious to livestock when eaten in large quantities. Also, because it is an oxidizing agent, materials sprayed with it become very inflammable and for this reason it is usually sold as a mixture with other chemicals which reduces the fire hazard, but even so precautions should be taken to prevent fires. All arsenicals are deadly poisons and animals should be kept away from plants sprayed with them. Ammonium sulfamate, a new herbicide, is relatively free from these hazards as it is not toxic to animals and has a retardant action on fire. All spray equipment should be thoroly rinsed after being used for herbicide spraying to avoid corrosion to metal parts of the pump and to avoid injury to orchard trees the next time they are sprayed.

DISEASE-RESISTANT VARIETIES

The damage caused by many virus diseases of plants has been avoided by the use of resistant varieties. To determine whether any peach varieties might be resistant to the yellow-red virus, a trial planting was made of the 45 most common peach varieties grown in New York State. These trees were supplied by interested nurserymen of the State thru the cooperation of the State Department of Agriculture and Markets. Trees of each variety were inoculated in 1940 and 1941 with buds from diseased peach or chokecherry. Other trees of each variety were left uninoculated for natural infection studies and controls.

The results of the inoculation experiments indicate that all 45 varieties may be artificially inoculated with the disease (Table 3). It is of interest to note, however, that some of the varieties were damaged to a greater extent than others. For example, with such varieties as

TABLE 3.—SUSCEPTIBILITY OF PEACH VARIETIES TO YELLOW-RED VIROSIS WHEN INOCULATED WITH DISEASED BUDS.*

VARIETY	TREES INOCULATED IN 1940–41			TREES NOT INOCULATED	
	Total No.	No. infected	No. dead	Total No.	No. infected
Hale Haven	4	2	0	4	0
Admiral Dewey	5	4	0	4	0
Golden Jubilee	4	4	0	5	0
J. H. Hale	4	4	0	5	0
Early Crawford	4	3	0	6	0
Crosby	3	3	3	3	0
Yellow St. John	4	3	1	6	0
Belle of Georgia	5	3	0	5	0
Heath Cling	5	3	0	5	0
Veteran	5	5	2	5	0
Rochester	3	3	3	7	0
Beer Smock	5	3	2	5	0
Vedette	4	4	0	6	0
Valiant	4	3	0	4	0
Hill's Chili	4	4	2	6	0
Radiance	4	3	0	6	0
Elberta	4	4	0	6	0
Viceroy	4	3	0	4	0
Salway	3	3	1	7	0
Salberta	3	2	2	6	0
Oriole	3	3	1	7	0
Fitzgerald	4	4	4	5	0
South Haven	4	3	0	6	0
Pioneer	3	1	0	7	0
Carman	5	3	0	4	0
Early Elberta	3	1	0	6	0
Champion	3	1	0	5	0
Livingston	2	2	1	5	0
Marigold	2	1	0	5	0
Hiley	2	1	0	6	0
Cumberland	2	2	0	6	0
Eclipse	3	2	1	5	0
Late Crawford	2	2	1	5	0
Mikado	2	2	0	5	0
Greensboro	2	2	0	6	0
New Prolific	2	1	0	6	0
Amber Gem	2	2	0	5	0
Kalhaven	3	3	0	3	0
Banner	3	3	0	4	0
Shipper's Late Red	1	1	1	3	0
Wilma	2	2	1	3	0
Gage Elberta	2	2	0	4	0
Welcome	2	2	0	6	0
Golden Drops	3	2	0	2	0
Rio-Oso-Gem	2	2	0	2	0

*The fact that the diseased buds were taken from immature growth may partly explain why 100 per cent infection did not occur in all cases. It is also possible that some of the symptomless inoculated trees may yet show symptoms.

Crosby, Rochester, Salberta, and Fitzgerald, all of the infected trees were dead by 1942, whereas there were no dead trees of many of the other varieties. By 1942 the inoculated trees of some varieties showed symptoms on all of the branches, while in other varieties the virus seemed to be confined to an area near the point of inoculation.

Uninoculated peach and chokecherry plants in this orchard have remained free of the disease for three years, showing that there has been no spread from the diseased peach trees. There were no wild infected chokecherries near this planting. Since there has been no natural infection in this planting to date, it is still unknown whether any varietal resistance might be shown to natural infection.

Besides the peach varieties tested, 22 other Prunus species, including plums, apricots, nectarines, sweet and sour cherries, and many wild species were included in the test planting. The results to date have confirmed Stoddard's report that nectarines, almonds, Bessey cherry, and Hortulana plum can be infected with the yellow-red virus. Certain of the other species, such as *Prunus japonica* and *P. americana*, are also possible hosts tho their symptoms may be different or absent. Until these tests have been concluded it seems best to recommend that new peach plantings be kept separate from all other cultivated or wild Prunus species. The common black or rum cherry, *P. serotina*, which often grows in association with the chokecherry, does not carry the disease. A study of Fig. 2 will aid in the differentiation of this species from the chokecherry.

NEW YORK NURSERY STOCK PROTECTED

Realizing the importance of keeping the nursery stock of the State free from this virus disease, the following statement was sent to the nurserymen of the State by the Department of Agriculture and Markets in 1940:

"In order to protect the nursery and orchard interests of the State, and in order to maintain the high standard of New York nursery stock and to comply with quarantines, the Department of Agriculture and Markets, under Article 14 of the Agriculture and Markets Law, will require this year that nurserymen eradicate the chokecherry (*Prunus virginiana*) within 500 feet of peach nursery blocks before the certificate of inspection required by law can be granted. It is further required that peach bud sticks be secured from peach nursery blocks or orchards entirely free from the disease and from locations not menaced by infected chokecherries."

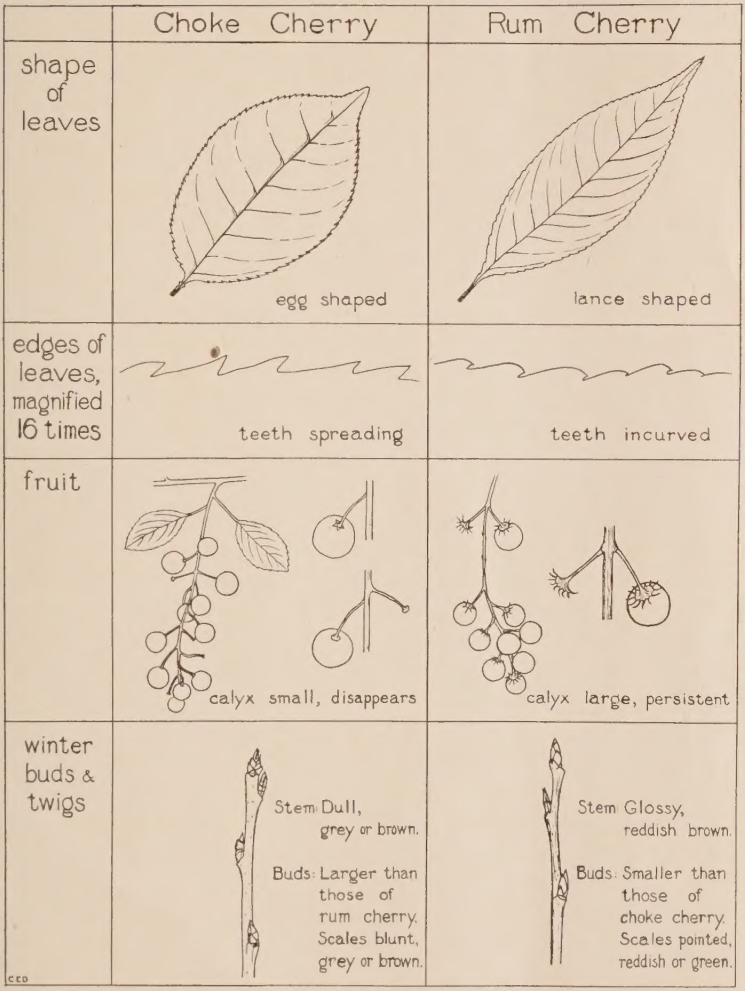

FIG. 2.—DIAGRAMMATIC CHART SHOWING THE CHIEF CHARACTERISTICS BY WHICH THE CHOKECHERRY (*P. virginiana*) MAY BE DISTINGUISHED FROM THE RUM CHERRY (*P. serotina*) WITH WHICH IT IS FREQUENTLY CONFUSED. (DRAWN BY CHARLOTTE E. DILL.)

The following year nurserymen were urged to keep their peach plantings separated from all wild Prunus species.